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East Europe Report

SCIENCE AND TECHNOLOGY

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CONTENTS

BRIEFS

ZEISS TELESCOPE FOR USSR OBSERVATORY--The 78-inch reflecting telescope installation presently being assembled on the Terskol plateau in the Northern Caucasus combines efficient technologies of three socialist countries. The large astronomical installation with its 115 foot dome-shaped building is being constructed as the central unit of the Terskol observatory in the immediate vicinity of Mount Elbrus at an altitude of 10,170 feet. Its high optical capacity will make it possible to obtain further information on distant galaxies. The first segments of the cupola weighing up to 25 tons arrived at their destination after being transported over 4,350 miles by ship from Rostock to Novorossisk, then by rail to Nalchik, and from there by flat-bed truck over high mountain roads especially widened for this purpose. After final assembly at the site the movable part of the telescope alone will weigh about 80 tons. The electronic control unit from the enterprise Vilati in Budapest, which will be equipped with a modern microcomputer, will assure an extremely precise setting of and tracking by the telescope even with exposure times of several hours. The first large-scale installation delivered to the USSR is operating in Shemakha which is also situated in the Caucasus. The Soviet Union supplied the blank for the 78-inch mirror which will be ground, polished, and sealed in JENA. The glass-ceramic mirror material exhibits an extremely low heat expansion, so that the excellent optical quality is preserved even with temperature fluctuations. The great power of the telescope can be illustrated by the following picture: The light of a candle could still be registered by it at a distance of 6250 miles. Telescopes from the VEB Carl Zeiss JENA, the largest manufacturer of astronomic equipment in the RGW, have already proven themselves in observatories in the Caucasus, the Pamir, and in the Tien Shan mountains. The tenth 39.37-inch (1 m) reflecting telescope since the introduction of the first one in 1972 is scheduled for delivery to the USSR still this year. [Text] [East Berlin FEINGERAETETECHNIK in German Vol 33 No 8, 1984 p 353] 12693

GDR ELECTRONICS CENTER IN MOSCOW--Moscow. On Wednesday, a technical center was opened in Moscow as a customer service for products of the VEB Combine Communication Electronics in use in the Soviet Union. The deliveries bearing the trademark RFT, including transmitting and receiving installations in the short wave range, telex technology, measuring instruments and electromedical equipment, will exceed this year R150

million. Engineers employed in special workshops of the center are maintaining, i.a., also facilities of the uniform communications system ENSAD, a new system developed jointly by experts from the GDR and USSR. The new technical center has the additional task of training and instructing Soviet customer service engineers. A permanent exhibit introduces the production profile of the combine and provides informaation on new developments, as well as development results of the GDR research in the field of communication electronics. [Text] [East Berlin NEUES DEUTSCHLAND in German 20 Sep 84 p 5] 12693

GDR CABLE TEST LAB FOR BUDAPEST--MKM director Dr. Onodi: "Technology is on a world class level". BUDAPEST (ADN/SZ). One of the largest test stations for the inspection of cables in Europe was turned over yesterday in the Hungarian Cable Works (MKM), Budapest. The installation was designed by the VEB Power Plant Construction in Halle/Leipzig and manufactured and delivered by the VEB Transformer and X-Ray Works (TuR) in Dresden. The complex has at its disposal three completely shielded test stations for the testing of alternating currents and is equipped with powerful transformers and modern measuring technique. MKM with its 3600 workers is the only cable manufacturer in Hungary. In an ADN talk the MKM director for Research and Development, Dr. Tamas Onodi praised the high quality of the engineering delivered by the GDR partners. He emphasized: "It is world class, the parameters are very hard. Hardly any other test lab in the world has such strict requirements. The volume this facility can test per shift is unique in Europe." The testing of the daily production, as well as research and development are combined in one laboratory. Dr Onodi added: "We already came to a good understanding with TuR Dresden in the planning stage so that the equipment was built according to our development plans. "The laboratory conforms to the requirements of the future. These were taken into account in the potential voltage level, the sensitivity of the equipment and the shielding. All this ensures that we will sell our products on the world market fighting against tough competition." [Text] [Dresden SAECHSISCHE ZEITUNG in German 25-25 Aug 84 p 6] 12693

CSO: 2302/22

ROBOTRON DIRECTOR HIGHLIGHTS TRENDS IN ELECTRONICS

Hamburg DIE ZEIT in German 10 Aug 84 p 4

[Article by Theo Sommer: "On the Path to Electronic Socialism?--the GDR in the Face of the Computer Revolution"; Theo Sommer spoke eight days with the leading cadres in the GDR. He ended his series of articles with a report on the futuristic ROBOTRON Combine.]

[Text] The town of Riesa is 55 kilometers away from Dresden. The route to this town is via the ancient military road which connects Poland and Bohemia with the West through the Elbe Valley. The landscape of a civilization which is almost unique. Overgrown quarries, vineyards. Meissen and Albrechtsburg: Gothic architecture; bars for Elbe River boatmen ("Golden Anchor," "Sailor's Rest"); wine taverns in which they sell "Meissen Domherr," a very palatable drink. Then Lommatzsch Hill with its villages of timber-frame houses in the midst of peaceful grainfields and endless fields of turnips. Here and there a hint of Baroque: In this land the East and South unite in Saxon sensuality. Here and there a new factory: Some 17 percent of East German electronics production has settled in the district of Dresden--with its 1.8 million inhabitants, about 10 percent of the population of the GDR.

At the outskirts of the town of Riesa, on the left-hand side there is an old inn. Its walls are solidly fitted together, and the window lintels are powerfully constructed. Above the doorway the inscription is emblazoned in faded Roman letters: "F. W. Krause, 1846." It was in the dance hall of this venerable establishment, which meanwhile has gone on to become the town's civic center, that the production of computers began in the GDR in 1969. Hundreds of people made plug-in boards and antediluvian germanium transistors. "That was still an easy-going time," says deputy director Zaulich. He has been a participant in this--originally as a radio technician--ever since the very first days. In addition to doing this job, at that time he completed a course of correspondence study and worked his way up to the top. He indulges in a modest amount of satisfaction when he tells about this. But pride shines from his eyes when he leads visitors through the workshop and describes the development of the enterprise.

Meanwhile, a modern production center has long since arisen in the open countryside. The 100 employees of 1969 have grown in number to 2,500. "We trained the wives of the steelworkers away from their saucepans." A body

of permanent workers has grown up. Between 60 and 80 electronics apprentices are hired each year for training. The assembly line in the dance hall has blossomed out into being the showpiece plant of the Robotron Combine--the business on the other side of the Elbe which corresponds the most closely to what Siemens is for us in the field of data processing: 70,000 employees, an annual sales volume of 5.5 billion. Of this sum, the Riesa plant earns 370 million. Production is climbing by 10 percent annually.

The workshop has the same appearance as it does everywhere. Perhaps it is lighter, more simply built, than it would be among us, with a touch of coldness also outside the fabrication area proper. But the mechanized assembly lines do not differ from what one finds at Siemens or with Sony. "We are strictly a subcontractor enterprise," declares Director Zaulich. "From us come the electronic modules for television sets and typewriters, and also the integrated circuits for intermediate and larger EDP units and microcomputers." In the shop a constant temperature of 22 degrees [Celsius] prevails. The humidity is regulated. The entire thing is more like a laboratory than a factory. The employees--including many girls--wear white coats and work in concentrated quietness.

In the management room, the conference table is laid in white for the obligatory snack. There are sandwiches, juices, soda water, brandy, and Moulin Rouge--cassis with vodka. Since we have had a hearty breakfast, we decline with thanks. "There was no raiding of the trade-union coffers" the woman escorting us comments with a smile.

"It struck me that some of the machinery comes from the West. Are you dependent on the West?"

"Yes and no." The answer to my question comes without hesitation. "For one thing, because of the Cocom [Coordinating Committee for East-West Trade Policy] list, there are restrictions. For another thing: Chips which do the work of 100,000 transistors have become mass-produced articles today. Chips performing the same as a billion transistors are x times more expensive, but if I really want to produce 10 top-quality computers, then I can do that too."

Embargoes Make No Sense

Later in Dresden, at the headquarters of Robotron, I raise the same question another time. The officiating general director, Prof Gerhard Merkel, gives the same answer as his Riesa works manager:

"Every embargo is nonsense in technical terms. Objectively speaking, it is possible by doing this to hamper a party for a certain time. But in the long run one simply provokes him to undertake an effort of his own. That was the case, to mention one example, with drive belts for special highly automated machinery. At that time we simply developed them ourselves. And it was just the same when an attempt was made to keep us away from the most modern hardware in microelectronics. At that point we carried out a very large project north of Dresden. Now it is the largest enterprise in the

Dresden area. Upshot: The embargo measures bother us temporarily, but they push us forward in the direction of advancement."

Prof Merkel calls attention in addition to another effect of Western embargo policy: "The GDR alone is too small to tackle many research projects. Therefore economic sanctions link us in an ever closer cooperative relationship to the Soviet Union, which being an immense economy has the resources to solve every problem in the long run."

"But then why is the attempt made again and again to smuggle in electronics from the West into the East Bloc--such as was done 6 months ago by way of South Africa, the FRG, and Sweden with the Vax 11-782 computer?"

"Well you know, almost anybody can make a computer nowadays. I really do not want to say anything negative, but by now computers of this performance class are being built by the Romanians already...."

Is the GDR lagging behind the West in microelectronics--by 7 years, as is asserted occasionally? Blanket statements are wrong in any case, says Prof Merkel, adding that it all depends on separate products and groups of products. Naturally there are technical differences, he says, such as between other countries also, and what is heard so often--namely that in its "stock" of computer technology the GDR is far behind the FRG--likewise stands in need of a more careful analysis.

It is commonly said that about 20,000 mainframe computers are in operation in the FRG, whereas in the GDR the figure is 700. Merkel does not go more deeply into these figures. His argument is a different one: "With us, the computers get used twice as intensively as in the FRG--for 20 hours daily, 7 days a week. And your businesses must take much greater pains with tasks such as ordering, accounting, and sales promotion. With us, 'by making use of the advantages of socialism,' as we are accustomed to saying, there are many uniform regulations: A host of administrative simplifications. In Dresden, the users have at their disposal 12 EDP systems."

Robotron is playing a central role in the country's entry into the electronic age, which has been called for and encouraged mightily in the GDR since the end of the 1970's. Many firms rich in tradition have been incorporated into this combine--the largest in the country: Triumph in Erfurt, Mercedes in Zella-Mehlis, Seidel + Naumann in Dresden; but completely new enterprises have been added also. At the same time the range of goods produced has changed: Typewriters and accounting equipment are now being joined by office computers, microcomputers, and process control computers. In the East Bloc alliance, Robotron is above all taking care of the intermediate field. Some 60 percent of its products is exported, and of this in turn 95 percent goes to the socialist countries. "Previously we have shipped hundreds of thousands of accounting machines to the Soviet Union, and these are awaiting their replacements," says Gerhard Merkel. "That could have also been business for you, but we are handling it." He adds: "In the USSR as well, performance is the decisive factor--and for 2 or 3 years now the question of taste and of design has been

important into the bargain. We must continue to bring to the market something different, otherwise we are out of the picture."

And the future? "We continue to participate vigorously in the global trend," responds Prof Merkel to my question. "Of course, we have not been doing this merely since yesterday. We sold the idea for the liquid crystal display (LCD) to the Japanese in 1971. We are on top of things as far as the fifth computer generation is concerned. For a long time already we have been doing research on image processing with special processors for landscape identification, as is needed for example by cruise missiles. For 8 or 10 years now we have been specializing in electronic blood analyses. We are analyzing our stands of forest by means of aerial survey photography. Our multispectrum camera was with the cosmonauts in outer space. We are working on an electronic method for examining aircraft tires--on behalf of a French firm. We are occupying ourselves with phonetic input and phonetic output. And so forth and so on."

Tinkering Has a Tradition

"How much military research are you conducting?"

"This is now a very minute portion of our work. How large the extent will be depends on whether mankind's common sense prevails. It depends on the outcome of large-scale politics. If there is no alternative, we will have to make a greater contribution."

Some 20 years ago, Manfred von Ardenne presented his vision of electronic socialism to three ZEIT editors in Dresden. Computers were to overcome the main weakness of the system, the faultiness of human planning: "As soon as electronically controlled machines take over here, we will have mastered all our difficulties."

Today, those on the other side no longer are talking so big. There are still hitches with the hardware, software is still lacking, and even the enterprises are being hesitant in coming to grips with the new possibilities of this technology. Nobody knows the problems better than the Robotron people. But there is no doubt about it: Even the GDR is moving forward in the epoch of electronics.

In Dresden, Prof Merkel has undertaken the sponsorship for a home computer club. The Technical University is going along with this as well. "There we let the fans have absolute free rein. They themselves write their own programs. We do not dictate anything. We want to bring out ideas there."

"Do you see the home computer wave splashing over the GDR as well--or do you perceive in this simply dissipation?"

"We have discussed this question at the Academy of Sciences. Does the computer help the children? When does it help them? Our teachers assume that first one must shape the pupils' notion of their conceptual world; at this stage it would be too early to put in front of them even a pocket calculator. But next year the pocket calculator will be introduced from a

certain grade on. There are still differences of opinion about the home computer. Certain series of experimental studies are running until 1986. Should one bank on the programming language Basic or not? Above all: Is the home computer the most important thing? Surely that is also a question of volume. We do not view the computer as hobby equipment, but conceive of it as a means for data processing."

The GDR has embarked on the journey into the data-processing age. How rapidly it makes headway along this path will depend substantially on Robotron. It is no accident that the headquarters of the electronics concern are located in Dresden of all places: In the Sunbelt of the SED Republic. There, tinkering and puttering has a tradition. In the Dresden museum there is a stuffed bear a meter tall, which strikes a drum punctually at the wake-up hour. This automatic clock from the 17th century is a forerunner of that new generation of robots which is supposed to change the countenance of the country between Priwall and Plauen, Gotha and Cottbus.

12114
CSO: 2302/6

EDP CENTER USING ESER EC 1055 M COMPUTER FOR DATABANK EXPANSION

Frankfurt/Oder NEUER TAG in German 13 Aug 84 p 5

[Article by Dr Otto Woesthoff, Enterprise Manager, Frankfurt/Oder VEB Data Processing Center]

[Text] The new quality of the economic strategy according to the standards set by the 7th conference of the Central Committee of the SED provides definite viewpoints also with regard to the application of EDP especially with respect to the relationship between the renewal process and the attainment of higher economic effects.

The utilization of EDP according to the so-called batch processing technology, in which the results are available at the earliest in 24 hours, is approaching a distinctly recognizable saturation limit. Greater rationalization effects are possible only if a direct dialog can be carried on with the machine and the response time behavior is reduced to seconds. This requires, however, organizational forms with higher values and the employment of data banks. The latter include also large central units from remote terminals for remote data processing, as well as the coupling of large EDP systems via fast communication lines of the German Postal Service.

This process will be introduced in the VEB Data Processing Center in Frankfurt (Oder) during the 4th quarter of 1984. Scheduled for use is a system of the type ES 1055 M with an extremely large internal and external storage capacity, an automatic graphic output unit, CRT display units for in-plant and teleprocessing, as well as office computers. The assembly of data banks has already started. Several different data banks are scheduled to be ready for use in 1985. The technical base of the data collection too will be completely renewed during the period of 1984/85.

The development emerging in this field will put exceptionally high demands on all employees, specialists and operations managers. Many steps have been taken meanwhile or are still being taken in the direction of further training. New jobs are being created, while others are becoming superfluous.

Even though information cannot be given at this point as yet on the new areas of application for EDP, some economic effects are already predictable. Thus, for instance, the consumption of EDP paper for printouts will be substantially reduced and the punch cards, with a consumption at present of still more than 40 tons annually, will become almost superfluous.

These new technical lines of development are meeting, of course, with a very positive response in the collectives. This is not exclusively due to an interest in new technology. Increased automation improves the working conditions also in the EDP process and frees labor for more creative work. This is of particular importance for young people who enjoyed a highly valuable training in a skilled trade or those in training groups at colleges and technical colleges. This new development has also been an important stimulus for the MMM movement. Our two youth research collectives were already invited to send delegates to the Central MMM [Fair of the Masters of Tomorrow] in Leipzig.

The shop collective of the VEB Data Processing Center Frankfurt (Oder) obtained especially satisfactory results to date in fulfilling the plan in the 35th year of the GDR. The initiative of the collectives brought about remarkable effects in the most varied fields, resulting mainly from major activities of the basic FDJ organization and the operations section of the Chamber of Technology. Initiatives on the part of the FDJ in the first half of the year led, i.a., to the freeing of existing magnetic tapes for an increase in output, while the Chamber of Technology concluded this year the efforts begun in the prior year with an application of the enterprise aiming at being awarded the title of "an exemplary enterprise by standards of power economy".

In addition, important technical solutions were developed and also prepared for later use. The innovator-movement has been expanded, many suggestions were submitted for saving material, while costs were lowered and problems solved by much work performed by the collectives themselves. By close collaboration with the Council of the city of Frankfurt (Oder) and the VEB Building Economy it was finally possible to carry out important restoration work resulting in improved working conditions for our colleagues.

The initiative of some comrades, who made it their special business to support the youth work, led to the construction of a youth club. This project was enthusiastically supported by the work force. We are confident the youth club will be ready for use by the basic FDJ organization in October.

Let us express our thanks at this point to all collectives and to the leadership of the social organizations for their excellent work to date in the realization of the resolutions adopted by the 7th conference of the Central Committee of the SED. The political work of the basic SED

organization on the explanation and application of the political-economic initiatives of the district was instrumental in these successes.

The further successes of the enterprise collective are determined decisively by the extent to which it is possible to increase the effectiveness of the EDP application by qualitatively new achievements on the basis of new technologies. For this purpose the initiative "ideas-solutions-patents" must be advanced with higher objectives in order to imprint in every colleague the effective fighting position for the further development of science and technology in the interest of higher national economic effects.

12693
CSO: 2302/27

COURSE FOR DESIGNERS OF CUSTOM MADE IC'S

Budapest HETIVILAGGAZDASAG in Hungarian 22 Sep 84 p 37

[Text] A further training course being started 1 October by the continued Training Institute for Engineering of the Budapest Technical University promises to be an interesting new chapter in the future of the Hungarian microelectronics industry and use of its products. The series of lectures titled "Design of Equipment--Oriented Circuits" is being held for graduate engineers and factory engineers in 15 week cycles which will be started continually depending on the number of applicants.

One of the most important goals of the Central Electronics Development Program (EKFP)--which the government adopted at the end of 1981--is starting domestic manufacture of equipment oriented circuits. These custom-designed circuits can be used only in one definite piece of equipment, but they occupy substantially less space, are much more reliable, use less power and can be more easily maintained than circuits figuring in catalogs. The organizers expect from the students primarily that after completing the course they will make better use of the results of the microelectronics investment program. For this reason the course is financed in part from funds available to the EKFP, and this is supplemented by a course fee of 7,200 forints per student.

The course is based largely on individual study. The 10-12 hours of video material, which the students can view individually too, the self-checking tests, design exercises supported by a computer and the significant opportunities for consultation count as unusually favorable material conditions in domestic university instruction.

The lectures will be given by domestic experts on the subject who cooperated in writing a 1,300 page textbook which was prepared quickly for local conditions (in 1 year).

The organizers feel that 22 hours of lectures and 30 hours of group problem solving will be necessary for successful completion of the course, which will take 150-250 hours depending on the background of the students. This will be supplemented by the 68 hours of consultation time and computer exercises recommended for each student. An opportunity for circuit design on the computer system of the Microelectronics Enterprise will be provided for the most successful students.

8984
CSO: 2502/3

HUNDREDTH MEGAMINI COMPUTER, TPA 11-48 COMPLETED

Budapest NEPSZABADSAG in Hungarian 6 Sep 84 p 5

[Text] The get-together yesterday in Szekesfehervar was brief but not insignificant because they were commemorating a new milestone in the development of the domestic computer industry. The 100th TPA 11-48 megamini computer was finished in the shop of the Computer Technology Experimental Plant Deposit Association (SZKUBT) in Szekesfehervar.

The SZKUBT was founded in 1980 by three institutes or enterprises--the computer technology division of Videoton, the Computer Technology Coordination Institute (SZKI) and the division of the Central Physics Research Institute (KFKI) of the Academy which deals with computer technology.

All three needed a small, mobile, flexible institution which would accelerate putting into manufacture and use of the results of research and development. This is the task of the SZKUBT, which is an independent legal person, which operates under the supervision of the Ministry of Industry and under the direct guidance of a council made up of the directors of the three founders.

Such an enterprise is important from the viewpoint of the research institutes because the institutes are incapable, with their own capacity, of small series manufacture of what they have developed, and this is indispensable. On the other hand, Videoton is too big to manufacture in such small series in its plant.

In the last 18 months one of the chief tasks of the SZKUBT has been series manufacture of the TPA 11-48, a further developed model of the TPA minicomputer series of the KFKI, which has a good reputation. This machine is in the megamini category for which there is great demand. Not one of the 100 units manufactured thus far has remained in the warehouse for even a day, all found owners, indeed they cannot satisfy the demand. The megamini size means that the capacity of the operational memory of the machine is in the megabyte range (megabyte means 1 million bytes, 1 byte equals 8 bits); that of this model, for example, is 4 M bytes. The limit on applications of the minicomputers used to be the small operational memory.

The TPA 11-48 megamini machine is used basically in three types of areas--for measurement and data collection in industry, in laboratories and in business mechanization--recently they have been purchased primarily for such purposes.

One datum illustrates the character of the machine; its price--in a usable form (that is with peripherals)--is several million forints.

8984
CSO: 2502/3

ACADEMICIAN VAMOS ASSESSES ELECTRONICS PROGRAM

Budapest SZAMITASTECHNIKA in Hungarian No 8/9, Aug/Sep 84 pp 1-3

[Article by Tibor Vamos, a revised version of a speech given in Zalaegerszeg at a joint session of the Janos Neumann Society of Computer Technology, the Hungarian Economics Society and the Scientific Society for Organization and Management with the title "Use of Microcomputers in 1984"]

[Text] The importance of spreading electronics is already becoming a commonplace and there is certainly no need to repeat our arguments among the users of computer technology. The national significance of the task has been formulated at the government level also in the resolution of the State Plan Committee and Council of Ministers which decided on preparation of the program. Today is a good occasion for us to exchange opinions about the outlines of it. Of course, we cannot talk about final ideas a year before the "final" text is prepared, for the dynamics in this area are extraordinarily great. We must develop a program which tries to look ahead a bit and not shoot behind the moving target, and on the other hand, we must constantly accommodate to what the world dictates to us.

By and large the opinion I will express here coincides with that of a number of colleagues, but in places it will deviate from theirs. But I would like to emphasize that what you will hear is not some sort of manifesto, rather it will be a base stimulating thought and debate, which we may then refine here or there in the months ahead.

Our Freedom of Movement

Hungary does not have a determining role in the process of the development of electronics. Our limitations are such that it is impossible not to take them into consideration, but it is very difficult to feel out the possibilities of our freedom of movement. The dynamic development of microelectronics is taking place in a period when the economic freedom of movement in Hungary--today and in the next few years--is quite small, and the assets which can be turned to development are extraordinarily narrow. We must reckon with the fact that the situation will not improve substantially in the next 2-3 years. Even if there is a thaw on the world market and in world politics (and as a result our external economic situation improves) a significant part of this improvement will have to be turned to reducing

or restoring our extraordinary debt burdens, incurred in recent years due to a late recognition of the situation, so that later--let us say, after 1987--we will have a greater degree of freedom. But we cannot wait until 1987. We do not have time to wait because the developed industrial countries with capital strength did not use the past period of economic recession to put a brake on technical development--as we said several years ago already--but rather they used it for extraordinary technical progress. The signs of this progress can be seen today in very many places, but a full unfolding of it can be expected only in the next few years. Now, when 1 M bit storage elements and 32 bit microprocessors have already appeared on the international market, when robots are preparing for a triumphal procession throughout the world and when a number of other revolutionary changes will be accompanied by the swift reconstruction of the entire telecommunications networks of countries with developed telecommunications systems--that is, not similar to ours--(conversion to fiber optics channels embracing the entire country and to united digital telecommunications systems), we must do our thinking in a situation which is characterized by narrow resources, and in addition to this we have a number of other limiting factors.

One limiting factor is the continually tightening embargo. (See MAGYARORSZAG, 1984/32/10.) We have reached the point where the American regime would like to include in the embargo those categories of personal computers which are being mass manufactured already in Hungary and other socialist countries, the 8 bit machines. They have recognized our backwardness in the area of software and as a result have made the embargo very hard in software trade also, which was completely open in earlier years. (For example, an export permit for a data base management system developed for microcomputers, thus not of great size, has been dragging on for more than a year.) It is also well known that the United States is now extending its embargo in part to those neutral countries which are suspected of shipping to socialist countries and they are even putting restrictions on their closest military allies. This has two goals: on the one hand to force these countries not to deliver to us and on the other hand to make a greater profit from its technological superiority in regard to these countries.

Another factor in our difficulties is that at the moment the European socialist countries are struggling with problems basically similar to but of a different character than ours. We have periods of difficult birth, and the events of recent years in Poland are only the sharpest manifestations of this. These labor pains, in some cases of crisis proportions, are the concomitant of the birth of a new world caused by technological, human or structural difficulties. For this reason the developmental programs originally put forward are realized very slowly. We are all suffering from the fact that in contrast to earlier agreements much of the equipment prescribed in the uniform computer system and other joint programs is not being made, or is not being made with the technical characteristics and reliability which would be required. They are not modern enough and there are problems with their delivery too. In some cases the prices of both parts and finished equipment are intolerably high, and the commercial conduct of the entire affair is unsuitable for satisfying the needs of a dynamic, swiftly changing area.

We must develop a foreward-looking program under these limiting conditions--a hostile environment, the difficulties of our friends and our internal problems. But among the things to be considered is the fact that today it is the generally accepted opinion of the regime that if there is an area for which we must sacrifice in the period ahead, under whatever circumstances, it is electronics and information technology, naturally up to the limit which the possibilities of the country permit at all. It is difficult to plan these possibilities, for we cannot establish the international price changes in which our technological level will determine, unfortunately to a very great degree, changes in the terms of trade. A deterioration in the terms of trade is the primary index of the technical status of a country in comparison with countries in the forefront and to a certain extent enjoying a monopoly situation. We can have little influence on many of our foreign trade relationships, including the agreements which can be signed or will be signed with the socialist countries, agreements which will determine in a fundamental way the balance situation of the country in the period ahead.

What Can Be Expected From the Spread of Electronics?

Our first thesis (which we would like for the public opinion at large to accept) is that we cannot expect from the spread of electronics that in itself it will radically improve the economic position of the country, that Hungary will become in the years ahead a considerable exporter on the international market of electronic equipment and computer technology devices, or even that we will be competitive on the European market or that our balances will improve as a result. On the socialist market also we must do hard work to retain our present positions. In the long run--in a way very healthy for us--there will be an end to that property of the market of the socialist countries that it takes over gigantic quantities of technically relatively backward and qualitatively not very well controlled products. A situation will come about rather quickly (and we saw this years ago) where we must manufacture products which can be sold on every market. They will demand from us products which correspond qualitatively to at least the medium European level. Naturally, this will make it possible for us to make similar demands in exchange trade--if we adapt to it properly. In the final analysis, the need to improve quality will aid progress from both sides over the longer run, and this will move us and our partners alike out of the state of peaceful stagnation.

It appears that the significance of the internal market must increase swiftly. We know that there was a long period when the internal market was not so large as to represent a real field for Hungarian industry and the abovementioned soft market provided industry with very comfortable conditions for survival. So we are trying to start from the idea that we must find the driving force for the electronics program in the reconstruction of the Hungarian electronics industry and in the use of its products. The saviour will not be the naked products of the electronics industry but rather the results of building them into systems, into applications. These we must be capable of exporting, raising the level of Hungarian production and services. So, I believe, the link has now been

made: We cannot expect the electronics industry to achieve a breakthrough on the international market by itself, we consider it necessary for it to be oriented much better to the internal market, and by using the internal market as an amplifier, it will have an effect on the general situation of the country and improve our international positions.

By and large the present production of our electronics industry is of a size which would correspond to the consumer needs of an honest, average industrial country. The present production, most of if for export, is the result of a very low consumption level which holds back the entire country. (This does not mean that we should position ourselves for self-supply and manufacture everything which domestic users need. Such an industrial policy would be technically impossible and economically suicidal, but the ratios indicate a tendency to underestimate the internal market and the possibility that the electronics industry should produce something to pay for good quality, modern import, which would pull down the embargo limits and encourage the friendly partners.) This production value is produced by 100,000 people. If we look at the international averages, at the personnel involved in the leading industrial countries, then it turns out that these 100,000 people are about 10-20 times more numerous than personnel producing a similar amount in such branches elsewhere in the world. In plain language, with a truly modern production apparatus this production should be provided by 10,000 people. Let me add that in these countries the distribution of the labor force is different than it is for us, because many more work in research, development, marketing and support. (By support I mean not only maintenance, but also tracking for the life of the equipment, aid to applications, thus constant care of the product.)

More people work in these areas and a lot fewer in the factory than here, because to a large extent production is carried out by prepared programs and machines. Those microcomputers which are being mass-produced now by IBM or even the Apple firm are produced on completely robotized assembly lines, making it possible for the annual volume of personal computers in the United States to approach the number of personal cars. This also indicates the gap which we slowly must begin to regard as a gulf.

If matters stand thus we must examine how we must radically renew the producing apparatus. Technologies of micron fineness, and a good bit under a micron, determine this new trend. These, primarily, will decide how far one can go in microelectronics and in the associated peripheral systems and memories. We must calculate the magnitude of reconstruction for a renewal of the tools of production. In Hungary and in the world as an average--here we are about equal--the capital yield in the electronics industry is about 1.2; that is, one can get about 1.2 forints (dollars, etc.) gross production per year with an expenditure of 1 forint (dollar, etc.). If we calculate back from this then this means that according to present estimates we can realistically accomplish only half of this in the next 5 years.

We get shocking figures if we look at how much we have invested in recent years--not always in the best. We should see and we should know that in

in a technological line--if the technology is interdependent, and here the technologies are interdependent--the weakest point always determines the quality of the final product. So it is in vain if nine units in a technological line are at the international level if there is even one which corresponds to the Hungarian fallow ground. In this case, unfortunately, we will produce a product of "Hungarian fallow" quality. And if we want to modify these in some phase with the old tools then the price of this is very high in reliability and in cost. As an estimate, perhaps half of the domestic electronics industry could be renewed in 5 years. But this must be done in such a way that it covers the entire cross-section in the given areas. It is not an easy task, but we should try to think in this direction.

So what is to be done? We have good starting points and there is a strategy which may be useful. It is obvious that in the world today microelectronics and semiconductor technology are the things which have drawing power for everything to a certain extent. We can say with pleasure that the Microelectronics Enterprise--not least of all as a result of great talents and determined guidance--is beginning to reach a level in production which will be capable of manufacturing semiconductor circuits, in a given assortment, in about that quantity which the country needs. In plain language, it will satisfy our original thinking, that Hungary should set up for a relatively narrow manufacturing spectrum of circuits but should make them in a quality and quantity which would be an exchange base with our other partners for the acquisition of the entire assortment, or at least a significant part of it. We cannot talk about a full assortment even in the case of the partners, for a number of products require very developed technology and they cannot be imported in return for counter entries, but the efforts of the socialist countries in recent years are beginning to pay off in this also. We are already working with samples of the Soviet 64 K byte memory chips, a few GDR 16 bit microprocessors corresponding to the Z8000 are in operation, and it is to be hoped that the majority of the semiconductor parts needs of the coming period can be obtained for counter entries--paid for with good products. But it is our thinking that in the period ahead the microelectronics base must be developed further and we must substantially improve the present 4-5 micron technology. The purity conditions necessary for this are already given in our manufacture, and we are proceeding well in circuit design also. But even in the future the semiconductor circuits will make up less than half of the parts, and the program for the development of other parts has fallen behind. We absolutely must accelerate this development; we must not forget about this parts base either.

Peripherals

The next critical area is that of disk stores. It is our conviction that no sort of program can be executed if there are not moving magnetic storage elements. Here also a rational and very difficult program is being born, going beyond floppy disks the development and manufacture of Winchester stores which will be needed for the personal computer and place of work computer categories. These will be primarily around the 10 M byte size, but in a later

part of the program we would like to increase their capacity by one order of magnitude. They will be needed for all more serious applications. It appears that in the future we will be able to provide printers or output peripherals suitable for the systems from domestic manufacture also.

Large Equipment and Microcomputers

What does this mean and precisely what sort of systems are involved? Development shows--in contrast to the earlier period when computer technology was based on very strongly centralized systems--that today to an increasing extent the overwhelming part of applications is taken care of by work site stations, cooperative systems built into nets. Naturally this does not mean that a national data bank like that of the Statistics Office or a Meteorological Computer Center (or application of a similar character) could be satisfied with stations based even on a 32 bit microprocessor. We are not thinking of this. Present development also shows that the age of large capacity computers is not over, they have special applications areas. We cannot deal with domestic manufacture of this machine category, but we can deal with their use. We must import them, and we hope that sooner or later this will be possible from socialist import too. Unfortunately, the biggest and most striking example of the weakness of the ESZR [Uniform Computer Technology System] program is that it was not able to bring to the market systems corresponding to the upper members of the original IBM 360 series brought out in 1964. The processors of those machines which really can be obtained today are of smaller capacity than the 32 bit microprocessors built into work site equipment. This must be overcome; this has become a vital strategic question.

In the present period we want to build on work site computers built into nets as we "did" correctly on minicomputers in the earlier program period. These work site computers should not be confused with the Spectrum or the Commodore and all the cute devices which are very useful from the viewpoint of education, from the viewpoint that the country is learning to handle computer technology. It is beginning to be seen what is needed. This does not solve the problem, but to see what it needed is a big thing in itself.

The work site systems must be much more serious, must be built on 16 bit processors at least, and these are beginning to be created in the country. It appears that they will go into series manufacture next year. Another condition for them is the background stores spoken of earlier. Whatever more serious data storage, data retrieval of planning task is involved one will need at least a few 10 M byte so-called Winchester disks as a first step. These are the systems which can operate in agricultural and industrial production, in the organization of production and in services, linked into local and interdependent nets and with the necessary software. Manufacture of this equipment would satisfy the needs in services and in almost all office applications, that is in the domestic mass applications and in export systems. If we make swift progress here then perhaps we can win the battle. This is our strategy.

Role of Applications

It is our opinion that if there is a machine and if there are the tools then the user groups for them will be born also. We can see this with pleasure throughout the country. That is why I like to go to the meetings of the county Neumann organizations, because one draws strength from the local initiatives. Organizations are being born which provide service for these systems too, the service and support for their entire life, of which I spoke earlier. In the crucial applications areas we must develop a few model systems, experimental systems, which can then represent a reference for domestic use and export. The first series must be manufactured with everything so we can get experience by virtue of which we can set up truly reliable mass manufacture. It is this way with applications systems also. We already have some experience. We want to produce graphic designing systems in this way as well; they too are under the embargo and there is an ever greater need for them in various factories in electronics, in the machine industry and even in light industry. We also want to develop press applications systems, which will make the reconstruction of the presses complete. We want these model systems for office systems linked with local nets, too. They should not be what we used to think an office is like but rather they should be information decision-making nerve centers that guide organizations. An office should not be a bureaucracy but rather a place for organizing with the aid of work site stations and the associated software based on local nets. Manufacturing systems are closely linked to the designing systems. We already have some experience in the area of numeric control, but this is no longer sufficient. We must move forward very quickly to flexible manufacturing systems, which can produce custom-made products with great flexibility with mass manufacturing technologies. The situation in the world today is that a custom-made character can be given even to the most typical mass product, the personal automobile, if a factory can produce several thousand variants in accordance with the orders. Within the framework of flexible manufacturing systems these can be produced by the same production tool with computerized controls, because the welding robots and fully automated machines need only be run with a different program. These manufacturing systems are also capable of providing the flexibility which reduces the throughput times, calculated from the order, to one quarter or one fifth in Japan today. We must establish such systems and work stations. This is possible for us and it will be needed. Perhaps the example of manufacturing systems illustrates best of all the extent to which electronics is becoming the tool (not in itself, but as a lever) for crossing the threshold which separates those of us living in this old world from the new world.

Telecommunications

Telecommunications should be a separate chapter of the program. I believe there is no need to sketch out the telecommunications situation in Hungary. We must give an answer to the question of the extent to which the program we are now starting meets the present needs and the extent to which it prepares the infrastructure for the period extending to the year 2000 or 2010, when voice transmission will be only one task of the telecommunications

network. Uniform, digital information communication systems will be needed through which the networks can contact one another. We must move very quickly in this direction, because it will be in vain to have local stations if we cannot ensure the linking of them, if the systems will not truly live. In the next few years the electronics achievements of the developed countries will be used many times more effectively than at present so that they can rely on these networks. In essence every work site in a country, and even in an international cooperation, will be linked as if they were in a single room.

You here in Zalaegerszeg know what it means to be far from a center like Budapest and what different conditions may reign if this distance could be practically eliminated not only by telephone but by the transmission of data, pictures and immediate production information. The extent to which this program can be linked to a general program for the spread of electronics is an open question; it depends on what licenses we can buy and what licenses we decide to buy. The device base or parts base of these licenses differ greatly. There are licenses for which the parts assortment falls completely outside what Hungarian industry will be able to produce in the next decade, and obviously we cannot get this manufacturing base. This increases our dependence further. Many such serious decisions stand before us.

So I must talk about the difficulties of those who make decisions, and I recommend that we should feel some empathy for those who undertake this burden and whom it is frequently the custom to abuse in the columns of the press and in private conversations. Their situation is not easy, for they must decide even when their choice will have certain disadvantages from some viewpoint.

External Contacts

I have already referred frequently enough to external contacts. Hopefully our contacts among the socialist countries will change a great deal, and in the direction of quality. We must prepare for this. We must start from the present situation and not from pleasant agreements based on friendship and good contacts. Even the officially announced conditions are hardening, and in the final analysis this is good for us. We cannot isolate ourselves from the world, just because of the large gap, and it will be necessary--insofar as possible--to lure foreign capital into the country and maybe even for Hungary to export capital and try to organize cooperation with countries where the freedom of movement in technology is greater.

Human Factors

We must keep our eyes open and watch development without prejudice, which includes the idea that we must have people with the ability and training to maintain intellectual, human contacts with all those areas from which we can expect progress for Hungary, independent of the development of the international situation.

The primary basis for every transformation, and thus for this one too, is the human factor. There is a new growing generation whose attributes are surprisingly good. We have seen in the Rubik's Cube competitions how much more quickly the teenagers can solve the task than grown-up mathematicians. We now have similar experiences in computer technology. The children can write fantastically clever programs, they are incredibly receptive. But we must educate an entire nation for this. We must educate a nation in user culture (in which we are certainly a bit backward), in organizational culture, even in the culture of human coexistence. For those cooperating organizations which must be created in connection with computer technology networks will require a cooperativeness which, unfortunately, has not at all been common in Hungary as a result of our historical traditions. And we must say also that in societies with goals that are much less societal public opinion honors cooperativeness better than we do. To a certain extent we must say, as a warning to our writers and especially to our journalists, that the ideal of the coming age will not be the lonely and fallen hero but rather the successful, charismatic person who is able to mobilize his environment. Please take a look at the successful countries. We do not have to explain our bad luck, rather, we must create our own successes.

Role of Technical Intelligentsia

At the beginning I talked about difficulties, then I tried to show that there are possibilities for movement amidst all the difficulties. Very much depends on our recognizing these and carrying to success the program which the Central Committee has now adopted for the further development of economic guidance; it is realistic, in many respects it is limited, but it does fit into the progress of the world and does carry the country forward, and it has special significance.

We are not sufficiently aware that what is involved here now is an interdependent progress of international significance--a moving forward in democracy. The further development of economic guidance and enterprise guidance in particular, the modification of the electoral system or the reform of the educational system all can have an effect in one direction, if we can conduct them consistently. He who understands this must be filled with enthusiasm even if he sees how many tangles we must still get through.

We must set up a restoration of the situation of the intelligentsia, the technical intelligentsia in particular, as a program for the coming period. We must create social conditions in which the intelligentsia can develop, live and act with influence in accordance with their calling. The social stratifying effect of and the system of conditions for the electronics program will prompt the country to do this.

In conclusion I would like to add to all this a quotation from a work by Mihaly Horvath which appeared in 1840 and was recently reissued in a reprint titled "The History of Industry and Commerce in Hungary During the Last Three Centuries." Mihaly Horvath wrote this 144 years ago in the closing

paragraph of the work: "Surely, if Hungary moves forward steadfastly on the path begun--not losing heart due to the difficulties which customarily afflict every beginning, improving its civil institutions as well in keeping with the times, in addition to perfecting its material condition, taking better care of public education--it has no cause to be anxious for its future. However, there is fundamental cause to hope for a flowering which will erase the ignominous stamp of centuries of stagnation from its brow, a flowering which will be worthy of a great and noble spirited nation. And is not this nation, in the heart of Europe and filled with enthusiasm for all that is beautiful and good and great, entitled to such hopes?! It has only to wish to be a nation, and its wish is not the dreams of a child!"

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AFFILIATES OF COMPUTER TECHNOLOGY, ADMINISTRATION ORGANIZING ENTERPRISE

Budapest SZAMITASTECHNIKA in Hungarian No 8/9, Aug/Sep 84 p 3

[Text] The Computer Technology and Administration Organizing Enterprise (SZUV) of the KSH [Central Statistics Office] has established three subsidiary enterprises in the area of microcomputer and minicomputer applications in order to expand its services.

The META-SYSTEM SZUV Systems Development Subsidiary Enterprise in Budapest will undertake to perform technical development tasks throughout the country. Its activity areas include: design and execution of mini- and microcomputer custom-made applications and distributed systems, enterprise screening and data modeling, using new methodological achievements and tools plus cooperating closely with the appropriate divisions of the parent enterprise. The subsidiary started in 1984 with 15 people, the majority of them experienced organizers and programmers.

The METAKOD SZUV Office Automation Development Subsidiary Enterprise in Kecskemet was formed primarily to solve mini- and microcomputer tasks for state administration. It organizes for a computer and programs records (for example, records on council members or highway signs) to accelerate council management, in cooperation with the State Administration Organization Institute.

It also offers computer technology services throughout the country to other budgetary institutions (hospitals, financial institutions). The subsidiary also participates in decentralized data preparation work for the State Census Bureau and the SZUV--using a central computer and local terminals.

It works primarily with Commodore-64 and Floppymat-SP machines, but it undertakes developments for other machine types as well (SZM-4 and VT-20).

The DIALOG SZUV Informatics Development Subsidiary Enterprise in Gyor has the following chief activities: complex contracting for installation of mini- and microcomputer systems, development and marketing of applications programs, development of microprocessor microelectronic products, design of program controlled automatic devices, consulting and training for use of informatics tools and organizing and operating information systems.

In its applications development work the 12 person subsidiary relies primarily on domestic microcomputers--for example the Comput-80 universal microcomputer family manufactured by the VKBM [Electrical Equipment and Appliance Works] Electronics Factory--but it also works with other machines on the market (for example, the Commodore).

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INTELLICON, HUNGARIAN AUTOMATIC TECHNICAL PROCESS CONTROLLER

Budapest SZAMITASTECHNIKA in Hungarian No 8/9, Aug/Sep 84 p 5

[Article by Attila Kovacs: "The Intelligent Intellicon"]

[Excerpt] One of the automated technological process control devices developed domestically and based on use of a microcomputer is the Intellicon shown by the MTA SZTAKI [Computer Technology and Automation Research of the Hungarian Academy of Sciences] at the spring Budapest International Fair this year. On the basis of a contract signed within the frameworks of the target program for research and development of automation devices, created with the central support of the OMFB [National Technical Development Factory] Automatics Works developed a one loop version and the MTA SZTAKI developed a multi-loop version (8-16 control cycles). The Intellicon is a further developed version of the MFB microprocessor process control equipment developed by the SZTAKI. About 30 of the MFB's, based on the Z80 and provided with complete, real-time applications program packages are in use domestically at this time (the Ajka Aluminum Factory, the Danube Iron Works, etc.). It is manufactured now by the VILATI [Electric Automation Institute], which has just completed a 25 unit series.

In the Intellicon equipment can be found, stored in EPROM and preprogrammed to about 28 K bytes in extent, a real-time operating system, functions realizing the man-machine link, self-check functions and a program solving more than 50 well-defined partial tasks.

The services of the Intellicon meet the most modern requirements, because the technologist (user) can organize the control strategy and set the control algorithms without computer programming knowledge by selecting what is required from these preprogrammed program elements--like building blocks--and linking them in the appropriate order. This organization is the "configuration" which can be done in a few minutes on the spot, by control cycle, with the aid of function keys which can be found on the front panel of the equipment. The program thus defined, which can be executed immediately, is stored in CMOS RAM protected by a storage battery. It is an advantage of the operator's panel that the "technology proximate" expert can quickly and easily access all information in the form he is used to. One can see simultaneously (illuminating diode display) the four operating modes of each control cycle, control errors, the check signal surpassing the

limit value, the number of the control cycle selected, the position of the associated manipulator and the most important data of the cycle. The built-in, continually operating self-check system is a modern solution; it indicates possible errors and when necessary automatically switches to a so-called manual operation console (optional). The equipment is also suitable for automatic determination of the optimal proportional-integrating-differentiating (PID) parameters of a given control cycle. The special purpose microcomputer used in the Intellicon aids greatly in ensuring that the equipment should be a device which can be used generally for the solution of process control tasks.

One applications area for the equipment is control of heat producing processes (industrial furnaces, boilers, dryers, etc.). There is no better example of the significance of its use than the fact that in a drying task to be realized in the near future it is expected to save 5-10 percent of the natural gas per year, which means about 1.2-2.4 million forints. The first "live" applications will begin next year. Three 16 cycle Intellicons will be delivered to the Romhany Tile Factory and the two Intellicons to be installed in the Sarkad Sugar Factory will operate with FESTO type programmed logic controls in addition to the process control tasks.

In the near future with a further development of the Intellicon equipment it will be possible to realize distributed control systems by connecting a maximum of 16 devices into a net with the aid of data transmission lines.

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REQUIREMENTS FOR RIAD SERIES THREE MSR HARDWARE SET

Budapest SZAMITASTECHNIKA in Hungarian No 8/9, Aug/Sep 84 p 10

[Article by Sandor Hauzmann: "Series Three MSR"]

[Text] At the end of 1983 the countries participating in the MSR [the small computer version of the Uniform Computer Technology System, or RIAD] program came to a final agreement on the materials of the preliminary plan for the third MSR series to be developed between 1984 and 1987. The preliminary plan has the following chapters:

--applications areas and system requirements for hardware and software tools,
--architecture and organizational principles for hardware devices,
--software,
--background stores,
--input/output equipment,
--process control devices,
--MSR network architecture,
--design and technology base,
--architecture of networks to be built on the ESR [RIAD[and MSR base, and
--element base.

We describe below the chief requirements set for the third MSR series.

Decreasing Costs and Increasing Production Volume

The development of mini and microcomputer families with common peripherals, systems equipment and software can be regarded as the chief achievement of the first and second MSR series; these machines satisfy the requirements made by system or ad hoc applications over a broad spectrum of important economic areas.

The development of computers belonging to the second MSR series has been completed and significant experience has accumulated while they and the machines of the first series have been used in various areas of science and economy (automated control systems for technological processes, design automation systems, automated systems for scientific research, etc.).

In addition to a further development of the minicomputers belonging to the first series the second series saw the appearance of microcomputers and special processors, new peripheral equipment, devices for linking systems and higher performance operating systems, which greatly broadened the possibilities for building systems as compared to the first series.

An analysis of the applications areas reflects the fact that a significant increase in the number of MSR systems being released, together with a reduction in specific manufacturing and applications costs, is needed to satisfy the quantitative demand, taking into consideration an expansion in applications areas as well. For this reason the chief goal in the case of the hardware and software tools of the third MSR series will be a significant increase in production volume and applications while there must be a substantial reduction in the costs of producing, operating and maintaining the equipment and in designing systems to be developed from MSR tools.

A broad spectrum of devices must be created in the third MSR series from the mass-produced, cheap, 1-2 card microcomputers and microperipherals that are necessary for them to the relatively more expensive, high complexity, medium series size 32 bit minicomputers.

Modernizing System Creation Technology

Expanding MSR applications, which is in harmony with large series production of computer technology devices, will require a modernization of the technology to create MSR systems. In the interest of this the problem-oriented principle will be realized gradually in the MSR; this will take into consideration the peculiarities of the information processing technology within the system and will significantly reduce the costs of development, system development or putting a system in use by a user, reducing the time by 1-2 years.

Need for Program Compatibility

When creating the second MSR series it was an important viewpoint that the user should get appropriately complete basic software from the beginning of series manufacture of the system. This could be done thanks to program compatibility between the first and second MSR series, which made possible the parallel development of the hardware devices and software of the second MSR series as well as use of the software of the first MSR series.

The experiences accumulated in the past decade of computer technology development (ESR and MSR) have shown the necessity of program compatibility between new and existing technical devices at the level of the operating system, from bottom up.

In addition, the introduction of new functional possibilities should be based on modern developments supported by software. Thanks to compatibility with the first and second series, already developed basic and applications software will be used in the third MSR series. In addition, new versions

of program tools with improved functions will be released, which will support the operation of the new hardware devices.

In the interest of a strict guarantee of the compatibility principle the operating systems ensuring effective use of the MSR devices must be standardized within the framework of developmental work on the third series.

In the course of developing operating systems for the third MSR series the following principles must be taken into consideration:

--the assortment should guarantee the most efficient use of the hardware possibilities of the smallest and the largest models of the MSR;

--it should ensure efficient use of MSR technical devices in various operating modes and under various applications conditions;

--it should ensure compatibility with the first and second MSR series at the operating system level; and

--it should also take into consideration the possibility of ensuring compatibility with the systems most frequently used as "world standards."

Preserving Peripheral Interfaces

Developmental experience in computer technology indicates the necessity of using existing peripheral equipment in new developments, in addition to expanding the catalog of peripherals, which makes it possible to develop a uniform peripheral catalog for existing and newly developed machines and makes it simpler to organize their mass manufacture.

Preserving the standard peripheral interfaces in the models of the third MSR series is an obligatory requirement.

Expanding Applications Areas

An analysis of the present use of MSR machines shows that the satisfaction of the needs of the leading users (technological process automatic control systems, production control, automation of scientific experiments, designing) is at a good bit higher level than in the following areas: transportation, education, medicine, agriculture, popular services, information systems, trade and business.

This is caused by the insufficient manufacturing volumes, the relatively high prices, the lack of configurations adapted to the needs of the various areas and the fact that users in these areas are not prepared for mass reception of computer technology devices. This situation will change significantly after 1985 with introduction of the MSR third series.

User Categories

The experiences gained with the wide use of the machines of the first and second MSR series have shown that the great majority of the users of these machines can be grouped (conditionally) in four categories:

--Those users who need simple computers with standard input/output devices (displays, printers) and external stores (disks, magnetic tape) for program development and to solve various technical-scientific or economic tasks (first category).

--The second category is that requiring a system specified for a custom order, supplemented with ad hoc applications software developed by the user.

--In the third category we can list those users who can use problem-oriented special systems with basic and applications software (including the operating system and standard applications program packages).

--In the fourth category we can list subscribers to computer networks and collective use systems.

Full satisfaction of the needs of users in every category must be ensured in the third MSR series.

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SPECIFICATIONS OF HUNGARIAN MATRIX PRINTERS

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[Text] We have devoted great attention in our journal already to the supply of peripherals for domestic and socialist computer technology devices. In the interest of better informing users we intend to continue to do so in the future also, giving it priority treatment. In the following table we compare a few characteristics of desk matrix printers, developed and manufactured domestically, which can be used primarily with microcomputers. The given data come from the manufacturers and indicate the situation at the end of May 1984; the prices are for information only.

[Table on following page]

Type	VT 21200	VT 21400	MP80	TMT 120I	TMT 120L	DCD-PRT-80	Karman Type*
Manufactured by/ sold by	Videoton-Walters/ Videoton		SZKI-MOM/ MOM	Telephone Factory/ Telephone Factory		Datacoop/ SZAMALK	Rozmaring Mgtsz
Point Matrix Number of raster points	9 x 9		9 x 8	9 x 7	18 x 40	9 x 7	7 x 5
Speed (characters per second)	125	140	80	160	40	80	80
Character set	96 ASCII 64 graphic (including 10 user characters, Hungarian accent marks also)		96 ASCII Hungarian accent marks, Cyrillic, Quasi-graphic, Graphic	96 ASCII Hungarian accent marks (choice of 7 national character sets		96 ASCII Hungarian accent marks, Cyrillic, Other, Graphics	96 ASCII Hungarian accent marks
Bidirectional printing	yes	yes	yes	yes	yes	yes	no
Selectable character width	yes	yes	yes	yes	yes	no	no
Number of positions per line	80	132-220	40-80-132	80-100-132-160		80	80
Programmability	ESC series, graphics (bit-image graphics)		Function, graphics, selectable from a large number of programs	Conversational		ESC series	A few ESC series

[Table continued, next page]

Type	VT 21200	VT 21400	MP80	TMT 120I	TMT 120L	DCD-PRT-80	Karman Type*
Interface	Parallel, 8 bits, Centronics compatible; option: serial CCITT V.24 (RS232C), 20 mA circuit loop, IEEE 480 instrument interface		Parallel, 8 bit, Centronics compatible	Parallel 36 point or serial CCITT V.24 (RS232C)		Parallel, 2 x 25 point DZM-180 compatible, option: serial, CCITT (RS232C)	Parallel, 8 bit Centronics compatible, option: serial, CCITT V.24 (RS232C)
Paper advance	Tractor		Combined (tractor and friction)	Tractor or friction		Combined	Combined
Number of simultaneous copies	4	4	2	3	3	3	0
Near letter quality	no	no	no	no	yes	no	no
Power (W)	100	100	100	100	100	100	40
Weight (kg)	13	13	10	9	9	11	5
Size (mm)	622x152x381		420x150x335	348x158x245		420x125x295	240x140x240
Price (1,000 Ft)	76.5	82	88	57-62		80	30**
Expected sales in 1984 (units)	2,500		750	2,300		2,500	***

* Being developed
** Guideline price
*** Marketing expected to begin in 1985

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TECHNOLOGICAL PROCESS CONTROL

Budapest SZAMITASTECHNIKA in Hungarian No 7, Jul 84 p 4

[Article by Kalman Balotay: "Technological Process Control; A Status Report"]

[Text] In the course of technical development the execution of production and technological processes, including the processes of industrial production activity, has been taken over from man more and more by self-operating, automatic equipment. Today we call this slowly but inexorably broadening process automation. Technical development today and the economic environment alike are pressing in the direction of an ever higher level of automation of the technological processes of production:

--the complexity of industrial technologies is becoming unsurveyable for a human being;

--equipment and products represent a very great value, and a possible human error could involve extreme damage;

--replacing human labor is coming into the foreground in jobs with a harmful effect on health;

--economic competition demands an increase in the efficiency and cost effectiveness of the processes;

--meeting ever increasing quality requirements is indispensable for competitiveness;

--technologies which conserve material and energy have come into the foreground, and these require automatic, optimized process control.

International Cooperation

A recognition of the constraining circumstances led in 1979 to the creation of the AIR-TF Temporary Work Group within the framework of CEMA cooperation activity. (AIR-TF is the Hungarian abbreviation for Automatic Control Systems for Technological Processes; the organizion is better known by the Russian language abbreviation ASZU-TP.) The work began, and continues today, within the organizational framework and under the supervision of the SZEAT

(Computer Technology Devices Applications Council). This makes it possible to create the scientific and material background for this increasingly important activity area with organized developmental activity making use of the advantages of international cooperation and also makes it possible to solve the problems faster with mutual use of the achievements.

The joint developmental work began with solving two problems of fundamental importance. On the one hand, a systematic survey of the existing achievements and realized systems had to be made, independent of the hardware and software background used. In the second place, the medium-range tasks of the cooperation plans had to be defined taking into consideration the longer range technical development trends.

With MSZR Devices

The MSZR [the small computer version of the Uniform Computer Technology System] devices were selected as the most important background for automation of process control, in such a way that the development of the scientific and material tools needed to solve specific tasks of process control should be realized via feedback from the requirements.

In the interest of facilitating the joint work a process control dictionary was developed recently and a unified record is kept of the systems realized independently or jointly by the participating parties. National software base bases (software banks) for process control had been created by the end of 1983 from the process control software solutions.

A number of high level results have been achieved in the past few years and many control systems have been realized. Because of the relative brevity of the joint work the larger part of the hardware and software background of these does not yet use the MSZR solutions posted as the goal and in the case of a smaller part priority was given to national industrial interests. This is so because in general the automation of a more complex technological process is linked to the investment in the technological process, and generally 2 to 5 years elapse from authorization to realization. In the second place, realizing the delivery of goods necessary to exploit the mutual advantages of cooperation is not free of problems, so use of devices existing in the national industry which are not MSZR devices has offered a swifter and more secure solution in the past.

From the viewpoint of the extraordinarily varied industrial technologies the device background will become manageable only over a substantially longer run and by means of extraordinarily circumspect joint development and division of labor agreements.

The spread of microelectronics in the automation of technological processes has made its effect felt in two areas already:

--New types of sensors manufactured with microelectronic technologies are being used in an ever broader assortment in measuring or sensing the parameters of the technological process;

--The device background for process control is made up of control equipment based on microcomputers linked into distributed intelligence, hierarchic and local communication nets.

A unique new sphere of tasks has appeared in the developmental plans for uniform international cooperation as well--the so-called flexible manufacturing systems. In present thinking the goal of development extending primarily to the area of the machine industry (not only machine manufacture but also, for example, the electronics, instrument and communications industry) is the creation of complex, automatic control systems which automate technological processes and the tasks of production guidance as well. With these systems one can solve more quickly and more economically, for example, the manufacturing conversion tasks for various products manufactured with the same technological equipment, and thus production can be adapted to market needs more flexibly.

The Domestic Situation

The domestic situation has a dual aspect:

--in the area of developing, manufacturing and realizing control systems of small and large scope we can lay claim to considerable and high quality achievements,

--our participation thus far in the joint international work is disproportionately modest compared to our own domestic development and export achievements.

At the present time, great efforts are being made in the international cooperation among socialist countries to increase the effectiveness of developmental work. One method for this is to do work of a contractual nature on the basis of commercial agreements. At the present time we have one such agreement and an application indicating cooperation intent has been made for five themes. The ratio of our participation in themes of a methodical nature is not greater either. It should be noted that activity of a methodical nature is a fundamental condition for participation in concrete developmental tasks.

We find a number of remote data processing applications in the control of chemical industry processes, in metallurgical applications, in house factory and construction materials industry systems, in control of animal husbandry installations and in energetics systems.

The first device development results have appeared in the course of the realization of the ministerial program for "Research and Development in Automation Devices and Systems", designated T-24 in the current five-year plan; the realization of primarily microcomputer model systems based on the achievements thus far will take place during 1984 and 1985. Based on developmental achievements supported by the central program we would like to broaden the participation of domestic developmental and manufacturing enterprises and institutions in international cooperation, laying better foundations for it, so that, despite our investment restrictions, we will be able to exploit the advantages of CEMA cooperation and make further progress in the area of automation of technological processes.

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BILATERAL AGREEMENTS IN COMPUTER FIELD

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[Article by Tamas Hirschler: "Bilateral Agreements; GDR, Soviet Union, Bulgaria"]

[Text] At its 12th session the permanent work group of Hungary and the GDR for electronics, computer technology, data processing and preparation devices reviewed the trade results of the 1984 Leipzig Spring Fair and established that--taking into consideration also the agreements signed earlier--both parties had fulfilled their quotas in both export and import with positions which were advantageous in practice. The signing of contracts for 1985 has developed well considering the time.

The technical-scientific cooperation work plan (MTE) for 1984 has been made precise. The MTE projects proposed by the GDR for the years 1986-1990 are the following: replacing capitalist import; developmental cooperation in the area of printers (laser printers); continuing cooperation in the area of developing storage devices, including the necessary measurement and testing devices; joint research on efficient electronic and mechanical manufacturing technology solutions; software preparation; joint development of remote data processing devices; development of cash register units (machines and systems) according to a joint project; and a study of the posssibilities of cooperative manufacture of copying devices.

A preliminary export list for the two sides for the period ahead was prepared and they informed one another about their import needs. A decision was made concerning replacement of capitalist import and accelerating the work connected with this.

At its 17th session the permanent work group for cooperation between the Ministry of Industry and the Instruments Industry Ministry of the Soviet Union dealt especially with the decisions of the Soviet-Hungarian intergovernment committee for economic and technical-scientific cooperation and with the measures following from the tasks decided upon at the most recent talks of Dr Laszlo Kapolyi, minister of industry, and M. S. Shkabardnya, minister of the instruments industry.

A decision was made about the further course of activity preparing for the cooperation judged useful in the areas of floppy dish and Winchester stores, alphanumeric printers, raster graphic and alphanumeric and color displays for personal computers, which are expected to be new directions in cooperation.

The Soviet side submitted a cooperation work plan for, for example, assembly of printed circuit cards, and for creation of flexible manufacturing systems (GAP's) serving manufacture, installation and testing of radio technology parts and IC's. They dealt with the status of the MSZR [minicomputer system] technical scientific cooperation plan for this year. The conference evaluated the first results of initiatives aimed at realizing the commercial deliveries according to a monthly schedule.

At its first session of 1984 the permanent work group of Bulgaria and Hungary for computer technology cooperation evaluated the status of trade and agreements and three essential questions figured on the agenda of the conference: harmonization of the chief trends up to 1990 of the development of computer technology manufacturing specialization and cooperation between the two countries; harmonization of the mutual delivery plans for 1986-1990; and harmonization of the MTE work plan for this year. The lists contain the traditional products of the present plan period and new products expected to appear in the years ahead.

In the course of harmonizing the mutual delivery ideas pertaining to the next plan period the Hungarian delegation started from the import needs. The Bulgarian side made a proposal for bilateral testing of the ESZ 9070 automatic data printer, perfection of manufacturing organization and quality improvement between the Veliko Trnovo Factory and the Telephone Factory, producing storage devices, and a joint study of applications areas for the professional personal computers produced by the Hungarian side.

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HUNGARIAN PRINTER: DCD-PRT-80

Budapest SZAMITASTECHNIKA in Hungarian No 7, Jul 84 p 5

[Article by Attila Kovacs: "Small Cooperative--Big Success: a Domestically Developed Printer"]

[Text] The Datacoop Computer Technology Small Cooperative, formed 2 years ago, successfully introduced at this year's Budapest International Fair its newest product--the DCD-PRT-80 matrix printer which it developed itself. The motive for developing the device--linked in part to earlier developments of the cooperative--was the demand of users that Datacoop expand with a printer the picture tube display terminals for local or remote connection to ESZR [Uniform Computer Technology System] computers. In addition, the development was justified by the shortage of printers which represents a limit on the spread of domestic microcomputers.

The DCD-PRT-80 can be used widely on the basis of its technical parameters and connecting unit. It is controlled by programming the built-in microprocessor and by interpretation of the data and control character codes received via the interface. A stepping motor moves the print head and the paper. The size and type of paper which can be used in printing (folded, edge perforated, normal letter paper, etc.) can be varied between wide limits up to 80 characters.

The DCD-PRT-80 can print standard Hungarian accented upper and lower case letters. There is also a possibility for printing Cyrillic or Latin upper and lower case letters and quasigraphic characters.

The selectable functions must be set by a program. The ink ribbon is placed in a cassette, and during printing it is moved by a direct current motor provided especially for this purpose. Two metal covers enclosing the connected mechanics and electronics make the portable desk printer into a device with a pleasing design.

The printing pins of the print head, which are made of a special material, can come into play not only in a position of rest of the motor but also in between two neighboring positions, that is, while stepping. This creates the so-called intermediate characters.

Printer Electronics

The electronics are placed on a single printed circuit card: this includes the interface unit, the elements of the control panel and the electronic part of the network power unit. The 2 x 25 point parallel interface card is made to permit direct connection. The connecting unit can be programmed by changing the contents of ROM and via a connector interchangeable with the well known DZM-180. The chief parts of the electronics are: microprocessor (CPU), RAM, ROM, character generator, a circuit controlling the stepping motor, controls for operator, display and sensing elements and the interface.

The printer hardly needs maintenance and its power consumption is tiny. The life expectancy of its ink ribbon cassette corresponds to the usual international values. The programmability of format, the ability to change distance between lines and the character width and select the character set contribute in great measure to the general utility of the DCD-PRT-80. A solution worthy of note is the combined tractor (advancing perforated fan paper) and rubber cylinder, which makes possible immediate use of unperforated sheet paper and makes it unnecessary to replace the advancing mechanism when using papers of different sizes and types.

Technical Characteristics

Printing Speed (characters per second)	80
Number of raster points	9 x 7
Character set	96
Number of print positions per line	80
Bidirectional printing mode	yes
Number of simultaneous copies (max)	3

Further Plans

According to Dr Ferenc Bindics, president of the small cooperative, by the end of the year they will completely replace with domestic and socialist parts the already low proportion of capitalist import parts. They have already replaced the print head, representing the largest capitalist import proportion, with one made domestically.

In the near future it will be possible to use a serial loop interface, or a CCITT V.24 serial interface realizing the RS232 protocol. Also in the immediate plans is the realization of character presentation making possible finer, letter quality resolution.

In the first half of 1984 the small cooperative began to fill an order for 500 units. They plan to sell 2,000 printers in the second half of the year. The SZAMALK [Computer Technology Applications Enterprise] will handle domestic sales of the devices which were created with ideas coordinated with SZAMALK.

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DOMESTIC BUBBLE MEMORY, RECORDING DEVICES

Budapest SZAMITASTECHNIKA in Hungarian No 7, Jul 84 p 10

[Articles: "Bubble Memory" and "Data Recording Devices"]

[Text] The useful storage capacity--depending on type--of the exchangeable cassette bubble memory of the MTA KFKI [Central Physics Research Institute of the Hungarian Academy of Sciencies] is 64, 128 or 200 K bits. Its applications areas are: tasks requiring nonvolatile background storage, process control under harsh industrial conditions and NC controlled machine tools.

Data Recording Devices

The VILATI [Electric Automation Institute] has introduced its IBM compatible Floppymat-SPD equipment, a further developed version of the Floppymat-SP with significantly increased capacity background storage, as a finished product. (A maximum of four floppy disk and four Bulgarian SZM-5400-00/24 disk stores can be used.) Modern and convenient data preparation and processing can be realized with the SLK-80/A, increased capacity magnetic cassette, floppy disk intelligent data recording system of the Budapest Radio Technology Factory. They plan to manufacture 100 units in 1984. The Personal Agroelektronics GT has announced a magnetic cassette tape field data recording system (the KATA). The system is made primarily for geodetic purposes and is suitable for recording numerical data and code signals. A keyboard and small printer developed by Datacoop are parts of the DCD-3275 remote picture screen data station of the Datacoop Computer Technology Small Cooperative. From the viewpoint of applications and programming it is compatible with the IBM 3275 terminal. A 128 K byte nonvolatile storage module can be connected to the device.

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HUNGARIAN SYSTEM FOR FREE-FORM SHAPES

Budapest SZAMITASTECHNIKA in Hungarian No 7, Jul 84 pp 12, 20

[Article by Gyula Hermann: "The First Domestic Machine Industry Model System"]

[Text] In the autumn off-season a series of conferences is held in Brighton, the famous English resort. The theme is computer aided design and flexible manufacturing systems. At the first conference on flexible manufacturing systems (FMS-1) one of the developmental directors of General Electric gave a talk titled "Automation or Elimination" which aroused a great stir. He announced that there was no other path than automation extending to the entire process, to intellectual and physical work alike. This recognition is supported by the fact that the market for computer aided design and manufacturing systems, especially turnkey CAD systems and CNC machinetool controls, is showing unambiguous and swift growth even amidst the present circumstances of the world economy. Herein the machine industry is the most dynamically growing applications area.

In the past 20 years the obsolescence time of new types of many industrial products has decreased significantly and the demand of the market for variants has suddenly increased. If the enterprises are to remain competitive under such conditions they must greatly accelerate development, planning and preparation for manufacture without increasing costs. There is now an entire series of industrial branches where the necessary variety of products can be guaranteed in a modern and economical manner only with the aid of CAD/CAM systems, even if the complexity of the products would not make this procedure absolutely necessary.

Expected Trade in Computer Graphics Devices in Western Europe
(millions of dollars)

	1984	1985	1986
Business	235	314	435
CAD/CAM	403	537	725
Technical/scientific	440	557	703
Total	1,078	1,498	1,863

At the same time, a large number of these factories are in the medium category; that is, they are not in a position to be able to cover the extraordinarily great research and development costs of their own systems. For this reason there is ever greater interest in system building elements which can be assembled into their own systems at much less cost.

The Domestic Model System

We recognized early the necessity of domestic research and development. At the initiative of and with the material support of the National Technical Development Committee the MTA [Hungarian Academy of Sciences] Computer Technology and Automation Research Institute, with the cooperation of the Machine Industry Technological Institute and the Machine Manufacturing Technology Faculty of the Budapest Technical University, began creation of an experimental computer controlled machine industry integrated parts manufacture, design and control system in 1977.

1. Testing of the research and development results (both hardware and software) under semi-operational conditions. We wanted to make possible the development and testing of the new ideas and methods before industrial introduction.

2. Support for engineer training, creating further training opportunities for experts working in industry. This was one of the chief reasons why the system was installed at the Budapest Technical University.

3. A reference system, which collects experiences in custom-made and small series manufacture and provides data for the solution of additional research and development tasks and simultaneously shows the results achieved.

The system which was prepared consists of the following chief units:

1. A manufacturing cell, which includes two lathes, a horizontal and vertical axis working center. We installed the machines around a large working area industrial robot, which had the task of providing the work pieces. A central shelf system stores the semi-finished and raw pieces. If need be buffer stores can be placed between the machines for storage during an operation. For manufacture of higher precision parts we provided for size checks of the raw piece of semi-finished piece on the machine tool. For this purpose we use a "convertible" measuring head developed at the SZTAKI [Computer Technology and Automation Research Institute]. The computer controls (CNC's) of the various machine tools evaluate the measurement results and make the necessary corrections on the basis of this. We fitted the manufacturing tools with various sensors to decrease the human supervision. The CNC computer control equipment on the various machine tools and the cell control which unites these with the work of the robot control carry out the control technology tasks.

2. Closely connected to the manufacturing cell is the quality control, the task of which is geometric checking of the finished work piece. This task is performed by a coordinate measuring machine equipped with a computer. We presume that in the case of small series manufacture only a representative sample of the finished pieces will have to be measured. The technological plan determines the taking of samples and this can be counter-checked by a manufacture control system.

3. When developing the geometric and technological design system we have not tried to create a CAD system closely linked to the given working system, rather we have aimed at creating a hardware and software assortment from which a design system for the given purpose could be prepared with little extra expense. Starting from this thinking a TPA-11/40 computer makes up the hardware base of the designing system (storage capacity 256 K bytes), together with the necessary magnetic disk and magnetic tape background stores. We solved the man-machine link with the aid of GD80 graphic and VT52100 series alphanumeric displays.

Software Tools

The efficiency of CAD activity is determined in a fundamental way by the operating system used, which must ensure swift and sure access to the stored data and the other resources of the computer (peripherals, central unit, background store, etc.). It depends on the operating system that the response time of the computer should be brief and that the batched and real-time programs should run efficiently together. And finally it should offer an ample assortment of text editors and program loading aids. We solved the demands being made simultaneously of the operating system by expanding the DOS.RV. This expansion ensures virtual memory management and automatic loading and saving of program segments. The system developed in this way represents a machine of about 1M bytes for the programmer.

One of the typical program languages for CAD systems is the so-called command language, with the aid of which the user controls the running of the program. The other is the computer program language, which is used by the person preparing the CAD system. Although the majority of technical programs are written in the FORTRAN language the number of programs written in higher level system programming languages is constantly increasing. This offers users the following advantages: easily reviewed documentation of the programs, simple transfer of hardware programs and a structured nature.

A system programming language satisfying the above requirements is GESAL, developed at the MTA SZTAKI, with which we have obtained favorable experience in placing various GAD systems into operation.

The command language is the communication tool between the user and the designing system. It is thus necessary that it have a vocabulary approximating the technical language and a mode of expression fitting it. It is an important viewpoint that its use not require computer technology expertise. Since every application requires a different command language it was useful to develop a general language generator with the aid of which the system programmer could produce a processor interpreting the command language specified by him. This task is carried out by a language system called PLACSY.

The geometric model stored in the computer plays the most important role in the mechanism of the models describing the design object; it contains all the geometric data of the modelled part (body). In general the geometric data are stored in some sort of hierarchic structure. For example, the bodies are characterized by their delimiting surfaces, edges and summits. Naturally the appropriate connections are stored also. Developing a general purpose

computerized geometric modelling system is a very large task and many research problems still must be solved. So we have developed target systems for easily distinguished parts groups. In general the graphics software must provide all these tools in the form of a subroutine package with the aid of which we can produce the picture of the desired part from the geometric model. This can be a traditional orthogonal technical drawing, a perspective or axonometric picture without covered lines or a shaded figure like a photograph. We prepared a subroutine package called GSS80 for the GD80 graphic picture screen to carry out the tasks of computer graphics. The developed software tools aid in large measure the preparation of special applications programs.

Applications Examples

Development of a computer system for design and working of plastic surfaces, the FFS (Free Form Shapes), was completed in 1983, based on the modules worked out in the model system. Systems similar to this play an important role in the armaments industry and so they are under a strict embargo even today. Plastic surfaces are important for various forging, casting and synthetics tools and in form design (in the porcelain and glass industry).

The system developed in the SZTAKI offers the user the following possibilities for definition of the surface:

--quadratic topology plane and cylinder surface distortion,

--rotation of the curve already defined above or displacement along another curve,

--giving sections of a ridge curve and sections at right angles to it.

Then the surface thus created can be further modified locally until the desired form is produced.

In the course of traditional procedures the form designer first prepares sketches and then prepares a plaster or clay model on the basis of the sketches. If the model meets the requirements it then serves as the basis for manufacture. In the FFS system the information needed for manufacture is produced from the computerized geometric model. The result is the NC control tape needed to produce the model or the tool. The technological design modules break down the processing into shaping and smoothing operations with a minimum of human intervention. We design the shaping for a highly productive (cylindrical) cutter in a plane at right angles to the main spindle of the machine tool. The goal is the most efficient possible removal of material. Smoothing takes place along isoparametric curves positioned on the surface, with a curved head cutting tool. In general the surface produced in this way then requires only polishing. The system described was shown at the Budapest International Fair this year, together with the Csepel Machine Tool Factory.

We have been testing the system since the end of 1982 with design and working of real industrial parts. The practical experiences show that designers can master operation of the program in a few hours, since it does not require knowledge of the mathematical apparatus behind it but rather is based on designer intuition.

Two ideas on using the FFS have developed: sale of the system (the program separately or as a complete design and working system, including the machine tool) and creation of a designer tool manufacturing service for industrial enterprises. A two-dimensional drawing system and a small computerized NC programming system for the FFS have been developed based on the modules already described and a conversational finite element net generator is being developed. These applications programs taken together constitute the nucleus of a turnkey machine industry designing system.

Conclusions

The initial experiences have proven the effectiveness of the developed system building philosophy. But the need to develop the domestic machine industry places ever greater tasks on the developers. The practical experiences have increased the appetite of the users. A swift development of the applications programs built into the system has become necessary. On the basis of the experiences acquired with the experimental system work is being done to develop a module set for manufacturing controlled by computer without supervision.

PHOTO CAPTIONS
[photos not reproduced]

1. p 12, top photo: The computerized system for design and working of plastic surfaces (FFS) in Pavilion C of the Budapest International Fair.

2. p 12, bottom photo: The geometric model appearing on the screen.

3. p 12, diagram: Structure of the FFS system.

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